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FOREST PRODUCTS LABORATORY † FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE

VENEER CUTTING AND DRYING PROPERTIES

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WATER OAK

By common usage the term water oak includes not only Quercus nigra but also willow oak (Q. phellos) and laurel oak (Q. laurifolia), and may include such other species as overcup oak (Q. lyrata). The species are common throughout the southern and southeastern States, being found chiefly along the borders of streams and swamps and in the rich bottomlands of rivers.[1]

Water oaks as a group are relatively fast in growth rate. Therefore, the grain pattern of rotary-cut veneer may be somewhat coarser than that of the more commonly used oaks. In color the wood has a somewhat brown-gray cast. In density and in their various mechanical properties, the water oaks are not greatly different from most of the other commercially used oaks. As with the other oaks, the green or wet wood will stain to a blue-black color when held in contact with iron for any length of time.

Water oak veneer may be used for containers of various kinds, including fruit crates, wirebound boxes, shingle boards, and the like. Some water oak has also been used in making up plywood panels for general utility, for which purpose it is well suited wherever its color and grain are acceptable. Plywood made from selected veneer may also be suitable for furniture construction and for such special products as plywood flooring.[2]

Selection, Handling, and Preparation of Logs for Cutting

Veneer-cutting tests were made on four different lots of water oak logs obtained from widely separated locations in the south. The logs were fairly representative of both good and poor quality for the species (table 1).

On the basis of the defects observed in the logs, it appears that the main defects to be avoided in veneer logs are grub holes (often visible on the cut cross section of the log), knots, sweep and crook, excessive butt swell (sometimes badly fluted), and irregular cross-sectional outline of the log.

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[1] Betts, H. S. The Oaks. American Wood Series. Forest Service, U. S. Department of Agriculture. 1945.

[2] Fleischer, H. O. The Utilization of Water Oak for Veneer. Southern Lumberman, Vol. 173, No. 2177. 1946.

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Some water oak bolts end-checked badly as soon as they were cross-cut. Others end-checked during storage. Protective end coatings were helpful for logs that were stored.[2] Keeping the storage period to a minimum was also definitely helpful.

The best cutting was accomplished when the wood was heated at 180° to 200° F. At these temperatures the veneer could be cut smooth and tight. However, excessive end splitting as well as some internal splitting occurred in the logs whenever the heating temperature was 160° F. or higher. At these temperatures the bolts occasionally broke out of the chucks as a result of excessive splitting, or in some cases the chucks turned in the bolt ends. When cutting unheated bolts, on the other hand, it was possible to produce usable but badly checked veneer, and occasional hard knots nicked the medium-temper lathe knife. The optimum heating temperature therefore appeared to be 140° to 150° F., at which temperature end splitting was not objectionable and the yield of split-free veneer was high. Cutting at this temperature did not adversely affect smoothness but did result in more looseness in the veneer, even with the best cutting technique.

Heating in multiple-bolt lengths and cross cutting to veneer bolt lengths after heating was found to be advantageous for producing a higher percentage of split-free veneer.

Debarking of veneer logs was difficult when they were heated at 140° to 150° F., whereas it was relatively easy at 180° F. or higher. Mechanical debarking equipment would, therefore, be helpful with this species.

From these tests it seems that water oak veneer logs 8 feet long or longer might well be heated in water at 150° F., for the following periods:

Average log diameter Inches	Required heating time Hours
12	5
18	24
24	50
30	85

This schedule can be approximated, from the practical standpoint, by laying aside the logs of larger diameters for heating over the weekend.

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[2] Southern Forest Experiment Station. Prevention of Deterioration in Stored Southern Hardwood Logs. New Orleans. 1949.

Lathe Settings

The lathe settings[4] given in table 2 were found suitable in most cases for producing good water oak veneer.

Veneer Drying

Most of the green water oak veneer had a moisture content of from 70 to 100 percent. The drying schedules in table 3 produced good results in drying veneer to a moisture content of 8 to 10 percent in a laboratory model progressive type veneer dryer. Because of local variability in moisture content within the log, it was sometimes necessary to increase the drying time as much as 40 percent. In a large mechanical dryer operating in a commercial plant, the veneer was dried to an average moisture content of 5 percent. The time required at 315 ° F. for 1/15-inch veneer was 16 minutes, and that for 1/7-inch veneer was 34 minutes.

Tangential (crosswise) shrinkage during drying to 5 percent moisture content was 12 percent of the green width, and that to 8 to 10 percent moisture content was 10 percent.

In general, the veneer dried well in the mechanical dryer at all drying temperatures investigated. Some honeycomb and collapse occurred in the thicker veneer (1/8-inch) cut from bolts heated at 180° F. or higher, and numerous hair-line checks developed in veneer of all thicknesses regardless of cutting or drying conditions.

In kiln drying the water oak veneer, it was found necessary to use relief stickers or finger racks to permit shrinkage and yet prevent excessive wrinkling and buckling.

Veneer Yields

Observations were made at a commercial plant of the cutting of 8,538 board feet (Doyle rule) of water oak and willow oak logs. The logs were of relatively low quality. Consequently, considerable waste developed because of the necessary trimming, spurring, and clipping. In this case a total yield of 6,990 board feet of veneer was obtained. All of this veneer was used in making three-ply, 4- by 8-foot plywood panels, a large proportion of which were grade 2 on the best face.

Gluability

The gluing properties of the species have not been completely investigated. Considerable quantities of veneer have been glued into plywood, however, by both hot-press and cold-press methods, and no special difficulties have been encountered. It has also been used in plywood in combination with sweetgum.

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[4] Fleischer, H. O. Experiments in Rotary Veneer Cutting. Proceedings, Forest Products Research Society. 1949.

Table 1.--Description of veneer logs tested

Source of logs	Near Millen, Ga.	Near Tallulah, La.	Near Mobile, Ala.	Near Brunswick, Ga.
Species	Q. nigra, Q. laurifolia	Q. nigra	Q. nigra	Q. nigra, Q. phellos
Number of logs	14	15	16	240
Log length, feet	4	16	16	22 (average)
Diameter, small end, in.	12 to 15	19 to 24	16 to 23	13 to 28
Rings per inch	5 to 8 (average)	6 to 7 (average)	2 to 5 near pith 7 to 11 near bark	3 to 8 near pith 13 to 32 near bark
Sapwood width, in.	1-1/4 to 2	1 to 2-1/2	2 to 3	2 (average)
Eccentricity of pith, in.	1/2 to 1-1/4	1/4 to 1-1/8	0 to 2	.....
Condition at start of test	Severe end-checking in spits of end coatings	Slight end-checking	Slight end-checking	Good
Av. moisture content, percent	.....	.....	52 to 106	.....
Av. specific gravity	.....	.....	0.53 to 0.70	.....
External appearance of logs	Knots and roughness indicated that logs were not of veneer quality.	Good quality veneer logs. One log was severely butt-swelled.	Butt-swell and taper pronounced. Some logs fluted. Logs mostly clear outside.	Many logs crooked, a few were knotty. About 10 percent showed grub infestation.
Typical defects encountered during cutting	Knots and cross grain plentiful. End-splits severe. Heartrot in one bolt. Worm holes common.	End-splits moderate to severe. Only few knots.	End-splits moderate. Knots few.	End-splits and knots moderate. Internal splits, worm holes, and decay encountered in some logs.

[1]Cut experimentally at Forest Products Laboratory.

[2]Cut commercially at Brunswick, Ga.

Table 2.--Lathe settings used for water oak veneer

Veneer thickness	Knife angle	Horizontal nosebar opening	Vertical nosebar opening
Inch	Degrees-Minutes	Inch	Inch
1/20	90-15	0.013	0.045
1/16	90-00	.016	.055
1/8	89-40	.027	.115
1/6	89-35	.028	.155

Table 3.--Drying schedules for water oak veneer

Veneer thickness	Temperature in dryer	Time in dryer
Inch	° F.	Minutes
1/16	200	18
	225	12
	250	9
1/8	300	20
	320	18

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